

REMARKS

Claim 1 has been amended to incorporate the features of Claims 4, 6 and 15.

Claim 15 has been amended to incorporate the features of Claim 17. Claim 26

(currently withdrawn) has been amended to incorporate the features of Claim 30.

Claims 4 and 30 have been cancelled. The features of Claims 6 and 17 which have

been incorporated into Claims 1 and 15 have been deleted. Claims 5 and 6 have

been amended to change the dependency to Claim 1. New Claims 32 and 33 have

been added. Support for these claims can be found in paragraph [0042] of the

specification and Claim 31 (currently withdrawn). No new matter has been added.

Claims 1-3, 5-29 and 31-33 are pending. Claims 13-15, 24-29 and 31 have been

withdrawn from consideration. Reconsideration and allowance are respectfully

requested in view of the following remarks.

Claim Rejections - 35 U.S.C. § 103**A. Claims 1, 2, 4, 7, 9, 10 and 12**

Claims 1, 2, 4, 7, 9, 10 and 12 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda et al. (U.S. Patent No. 6,488,863) ("Yatsuda") in view of Tamura et al. (U.S. Patent Application Publication No. 2001/0009178) ("Tamura") and Ramanan et al. (U.S. Patent No. 6,529,686) ("Ramanan").

Applicant respectfully notes that features of Claims 4, 6 and 15 have been incorporated into Claim 1 and that Claim 4 has been cancelled. In rejecting Claim 6, the Official Action contends that Yang et al. (U.S. Patent No. 6,635,580) ("Yang") discloses the features of Claim 4 (Official Action at pages 8-9, bridging paragraph). In rejecting Claim 15, the Official Action contends that Kadotani et al. (U.S. Patent Appl. Pub. No. 2004/0163601) ("Kadotani I") suggests "cooling of the heat transfer

member at a rate of from about 0.25-2°C/sec" (Official Action at page 8). Applicant respectfully traverses this rejection, because the applied references do not disclose or suggest all claim features.

Amended Claim 1 recites, *inter alia*, a substrate support comprising, a metallic heat transfer member overlying the ceramic member, the heat transfer member having a maximum thickness of about ¼ inch, the heat transfer member including at least one flow passage through which a liquid can be circulated to heat and cool the heat transfer member and a controller operable to control the volumetric flow rate and/or the temperature of the liquid circulated through the at least one flow passage, so as to control heating and cooling of the heat transfer member at a rate of from about 0.25-2°C/sec (emphasis added).

Under 35 U.S.C. §103(a), the Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. M.P.E.P. § 2142. As set forth in M.P.E.P. § 2143, one requirement for establishing a *prima facie* case of obviousness is that the combination of references must teach or suggest all the claim features. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). For a proper obviousness rejection, the Patent Office must provide "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness" and not "mere conclusory statements." *KSR Int'l Co. v. Teleflex Inc.*, 82 USPQ2d 1385, 1396 (U.S. 2007) (quoting *In re Kahn*, 441 F.3d 977, 988, (Fed. Cir. 2006)).

1. The Cited Combination Does Not Disclose or Suggest All Claim Features

As discussed below, Yatsuda, Tamura, Ramanan, Kadatoni I and Yang do not disclose or suggest the combination of features recited in Claim 1 which includes a

"liquid ... circulated to heat and cool the heat transfer member" or "control heating and cooling of the heat transfer member at a rate of from about 0.25-2°C/sec" (emphasis added).

a. **Yatsuda Provides No Disclosure of Heating and Cooling the Heat Transfer Member with a Temperature Controlled Liquid or Heating and Cooling Rates**

Yatsuda discloses a "cooling jacket 34 ... formed in the worktable 18, so that the wafer W is kept at a predetermined temperature by causing a coolant to flow in the jacket 34" (column 3, lines 53-55; FIG. 1). However, Yatsuda provides no disclosure that worktable 18 is heated by flowing a liquid through cooling jacket 34. Moreover, Yatsuda provides no disclosure of heating and cooling rates of worktable 18.

b. **Tamura Provides No Disclosure of Heating and Cooling the Heat Transfer Member with a Temperature Controlled Liquid or Heating and Cooling Rates**

Tamura discloses "a coolant flow passage 42 for conducting a coolant to control the temperature of the substrate 1" in holding member 2 (paragraph [0081]; FIG. 9). Moreover, "[t]he coolant to control the temperature of the substrate 1 is introduced into the coolant flow passage 42 ... to control the temperature of the holding member 2 and the dielectric material 18 at a given temperature" (paragraph [0083]) (emphasis added). However, Tamura provides no disclosure that holding member 2 is heated by flowing a liquid through passages 42. Moreover, Tamura provides no disclosure of heating and cooling rates of the holding member 2.

c. **Ramanan Provides No Disclosure of Heating and Cooling the Heat Transfer Member with a Temperature Controlled Liquid or Heating and Cooling Rates**

Backplate **20** of Ramanan, which holds semiconductor device **12**, includes "one or more heating elements ... preferably in the form of resistive heating element[s]" (emphasis added) (column 13, lines 43-45). To cool backplate **20**, it is placed in thermal contact with cooling member **26** (column 13, lines 64-66), which is chilled with "a liquid cooling medium" (column 14, lines 18-21). As such, Ramanan provides no disclosure that backplate **20** is heated by a temperature controlled liquid. Moreover, Ramanan provides no disclosure of heating and cooling rates of backplate **20**.

d. **Kadotani I Provides No Disclosure of Heating the Heat Transfer Member with a Temperature Controlled Liquid**

Kadotani I discloses a specimen table **107** including aluminum electrode block **201** (paragraph [0058]). The aluminum electrode block **201** contains coolant flow channels **11** and **12** (paragraph [0066]). Kadotani I further discloses flowing coolant through channels **11** and **12** at 20°C (paragraph [0077]). As such, Kadotani I provides no disclosure that aluminum electrode block **201** is heated by a temperature controlled liquid. Moreover, Kadatani I provides no disclosure of heating and cooling rates of the aluminum electrode block **201**.

e. **Yang Provides No Disclosure of Heating the Heat Transfer Member with a Temperature Controlled Liquid or a Controller Operable to Control Liquid**

Yang is directed at controlling the wafer temperature in a plasma etcher during plasma processing (column 5, lines 54-56), in which wafer **44** is placed on an e-chuck **42** and cooling gas is supplied to cool wafer **44** (column 2, lines 42-47).

Yang discloses that when an increase in wafer temperature is detected "controller 80 sends a signal 82 to the second flow control valve ... such that a larger volume of cooling gas may flow through the gas outlet conduit 66" to cool the wafer 44 (emphasis added) (column 6, lines 43-51). As such, Yang provides no disclosure that e-chuck 42 is heated by a temperature controlled liquid. Moreover, Yang provides no disclosure of heating and cooling rates of the e-chuck 42.

2. Kadotani I Does Not Disclose or Suggest Cooling Rates of 0.25 to 2°C/Second

The Official Action acknowledges that Yatsuda, Tamura and Ramanan do not disclose the claim feature of "cooling of the heat transfer member at a rate of from about 0.25-2°C/sec" and cites Kadotani I to cure this deficiency (Official Action at page 12, ¶4 - ¶6).

The Official Action contends that it would have been obvious "to optimize the coolant flow rate and temperature of the coolant ... to obtain [the] required heat transfer rate in the electrode block [201]" (Official Action at page 13, ¶1). However, Kadotani I discloses a specimen table 107 including aluminum electrode block 201 with a thickness of 25 mm (i.e., about 1 inch thick) (paragraph [0058]). As disclosed in Applicant's specification (paragraph [0042]), the relatively thick and massive aluminum electrode block 201 of Kadotani I would be expected to have a cooling rate of less than 1°C/minute (discussed in greater detail below). The Examiner has provided no additional evidence that a cooling and/or heating rate of about 0.25 to 2°C/seconds can be achieved in the 25 mm thick (about 1 inch thick) aluminum electrode block 201 of Kadotani I. Thus, the Examiner's position that "it would have been obvious ... to obtain desired heat transfer rate between [the] coolant and the heat transfer member (0.25 degrees C/sec) as taught by Kadotani ... by optimizing

result effective variables like coolant flow rate and coolant temperature" (Official Action at page 13, lines 12-15) lacks any factual basis and is based on speculation as to the cooling rate in Kadotani I. *In re Warner*, 379 F.2d 1011, 154 USPQ 173 (CCPA 1967), *cert. denied*, 389 U.S. 1057 (1968).

3. Rebuttal Evidence that Heating and Cooling Rates of 0.25 to 2°C/Second Cannot be Achieved in the 25 mm Thick Aluminum Electrode Block of Kadotani I

As described in the Applicant's specification, heating or cooling rates of 0.25 to 2°C/second (i.e., 15 to 120°C/minute) cannot be achieved with large metallic cold plates having a thickness of 1¼ inch or more (31.75 mm or more) (paragraph [0042]). As further explained in the specification, large metallic cold plates with a larger thermal mass provide only a limited temperature change rate of 1 °C/minute or less (paragraph [0042]).

Because the thermal mass of Kadotani I's aluminum electrode block 201 (i.e. a thickness of 25 mm) (paragraph [0058]) is similar to the large metallic cold plate disclosed in Applicant's specification (i.e., a thickness of about 31.75 mm or 1¼ inch) (paragraph [0042]), it would be expected to have similar heating and/or cooling rates of 1°C/minute or less. As such, Applicant submits that the claimed heating and cooling rate of 0.25 to 2°C/second (15 to 120°C/minute) is a substantial improvement compared to the much slower 1°C/minute rate expected for Kadotani I's aluminum electrode block 201.

Because a *prima facie* case of obviousness has not been established, Applicant respectfully requests withdrawal of the rejection of Claim 1 under 35 U.S.C. §103(a). Dependent Claims 2, 6, 7, 10 and 12 are also patentable over the

applied combination of references at least for the same reasons as those discussed above regarding Claim 1.

B. Claim 3

Claim 3 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura and Ramanan and further in view of Kadotani I.

The Official Action acknowledges that Yatsuda, Tamura and Ramanan do not disclose the features of Claim 3 and cites Kadotani I to allegedly cure these deficiencies (Official Action at page 7). However, as discussed previously, Kadotani I fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 1.

Accordingly, Applicant respectfully submits that Claim 3 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

C. Claim 5

Claim 5 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura and Ramanan and further in view of Kadotani et al. (U.S. Patent Appl. Pub. No. 2001/0018828) ("Kadotani II").

The Official Action acknowledges that Yatsuda, Tamura and Ramanan do not disclose the features of Claim 5 and cites Kadotani II to allegedly cure these deficiencies (Official Action at page 8). However, Kadotani II fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 1.

Accordingly, Applicant respectfully submits that Claim 5 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

D. Claim 8

Claim 8 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura and Ramanan and further in view of Mahawili et al. (U.S. Patent No. 6,007,635) ("Mahawili").

The Official Action acknowledges that Yatsuda, Tamura and Ramanan do not disclose the features of Claim 8 and cites Mahawili to allegedly cure these deficiencies (Official Action at pages 9-10). However, Mahawili fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 1.

Accordingly, Applicant respectfully submits that Claim 8 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

E. Claim 9

Claim 9 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura and Ramanan and further in view of Mimura et al. (U.S. Patent No. 7,022,616) ("Mimura").

The Official Action acknowledges that Yatsuda, Tamura and Ramanan do not disclose the features of Claim 9 and cites Mimura to allegedly cure these deficiencies (Official Action at page 11). However, Mimura fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 1. Moreover, Mimura discloses that support table 2 includes a refrigerant area

17 for cooling (column 3, lines 34-42), but provides no disclosure that support table 2 is heated by flowing a liquid through refrigerant area 17.

Accordingly, Applicant respectfully submits that Claim 9 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

F. Claim 11

Claim 11 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura and Ramanan and further in view of Wang et al. (U.S. Patent Appl. Pub. No. 2002/0075624) ("Wang").

The Official Action acknowledges that Yatsuda, Tamura and Ramanan do not disclose the features of Claim 11 and cites Wang to allegedly cure these deficiencies (Official Action at page 11, last paragraph to page 12, ¶3). However, Wang fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 1.

Accordingly, Applicant respectfully submits that Claim 11 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 1.

G. Claims 15, 16, 18, 21 and 23

Claims 15, 16, 18, 21 and 23 were rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura and Ramanan and further in view of Kadotani I.

Amended Claim 15 recites, *inter alia*, a substrate support useful in a plasma processing apparatus, comprising a heat transfer member including at least one flow passage in fluid communication with the liquid source and through which the liquid

can be circulated to heat and cool the heat transfer member at a rate of from about 0.25-2 °C/sec (emphasis added).

As discussed previously, Yatsuda, Tamura, Ramanan and Kadotani I do not disclose or suggest a heat transfer member with a "flow passage in fluid communication with the liquid source and through which the liquid can be circulated to heat and cool the heat transfer member at a rate of from about 0.25-2 °C/sec," as recited in Claim 15 (emphasis added). Furthermore, as discussed previously, Applicant has provided rebuttal evidence that the 25 mm thick aluminum electrode block **201** of Kadotani I cannot be cooled at a rate of from about 0.25-2°C/sec.

Because a *prima facie* case of obviousness has not been established, Applicant respectfully requests withdrawal of the rejection of Claim 15 under 35 U.S.C. §103(a). Dependent Claims 16, 18, 21 and 23 are also patentable over the applied combination of references at least for the same reasons as those discussed above regarding Claim 15.

H. Claim 17

Claim 17 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura, Ramanan and Kadotani I further in view of Yang.

The Official Action acknowledges that Yatsuda, Tamura, Ramanan and Kadotani I do not disclose the features of Claim 17 and cites Yang to allegedly cure these deficiencies (Official Action at page 14). However, Yang fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15.

Accordingly, Applicant respectfully submits that Claim 17 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

I. Claim 19

Claim 19 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura, Ramanan and Kadotani I further in view of Mahawili.

The Official Action acknowledges that Yatsuda, Tamura, Ramanan and Kadotani I do not disclose the features of Claim 19 and cites Mahawili to allegedly cure these deficiencies (Official Action at page 15). However, Mahawili fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15.

Accordingly, Applicant respectfully submits that Claim 19 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

J. Claim 20

Claim 20 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura, Ramanan and Kadotani I further in view of Mimura.

The Official Action acknowledges that Yatsuda, Tamura, Ramanan and Kadotani I do not disclose the features of Claim 20 and cites Mimura to allegedly cure these deficiencies (Official Action at page 16). However, Mimura fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15.

Accordingly, Applicant respectfully submits that Claim 20 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

K. Claim 22

Claim 22 was rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Yatsuda in view of Tamura, Ramanan and Kadotani I further in view of Wang.

The Official Action acknowledges that Yatsuda, Tamura, Ramanan and Kadotani I do not disclose the features of Claim 22 and cites Wang to allegedly cure these deficiencies (Official Action at page 17). However, Wang fails to cure the above noted deficiencies regarding the combination of applied references, with respect to Claim 15.

Accordingly, Applicant respectfully submits that Claim 22 is patentable over the combination of applied references for at least the same reasons as those discussed above regarding Claim 15.

New Claims

The newly submitted Claims 32 and 33 set forth an additional combination of features, which is further patentably distinguishable over the applied references.

Conclusion

For at least the foregoing reasons, Applicant respectfully submits that all pending claims are allowable, and this application is in condition for allowance. Accordingly, Applicant requests a favorable examination and consideration of the

instant application. Should Examiner Dhingra wish to discuss this application,

Applicant requests that the undersigned be contacted at the number below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: October 29, 2007

By:



Eric B. Chen
Registration No. 52,725

P.O. Box 1404
Alexandria, VA 22313-1404
(703) 836-6620